#10
1.11.3

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

I hereby certify that this correspondence is being deposited with the U.S. Postal Service as first class mail in an envelope addressed to Commissioner of Patents and Trademarks, Washington, D.C. 20231 on December 30, 2002.

Signature

Applicant	:	Jin-Sung Kim, et al.
Application No.	:	09/766,520
Filed	:	January 19, 2001
Title	:	ELECTROLYTE FOR LITHIUM SECONDARY BATTERY AND LITHIUM SECONDARY BATTERY COMPRISING SAME
Grp./Div.	:	1745
Examiner	:	Susy N. Tsang Foster
Docket No.	:	41546/DBP/Y35

RULE 132 DECLARATION

Post Office Box 7068
Pasadena, CA 91109-7068

Assistant Commissioner for Patents
Washington, D.C. 20231

Commissioner:

I, Jin-Sung Kim, hereby declare that:

1. I received a bachelor's degree in chemical engineering from Han-yang University in 1998. I have been employed by Samsung SDI Co., Ltd. and a Research Fellow at the Mobile Energy center since 1998. My responsibilities involve research in the area of electrolytes for lithium ion batteries, and I consider myself an expert in the field of electrolytes for lithium ion batteries.

Application No. 09/672,287

3. I have reviewed U.S. Application No. 09/766,520, of which I am a co-inventor. I understand that the amended claims of U.S. Application No. 09/766,520 recite an electrolyte for a lithium secondary battery comprising a non-aqueous organic solvent, and a sulfone based organic compound represented by one of Formulae (I), (II) and (III) of the application, where the amount of the sulfone based organic compound is from 1 to 5 weight%.

4. I prepared several lithium batteries containing electrolytes comprising a non-aqueous organic solvent and a sulfone based organic compound selected from vinyl sulfone, phenyl sulfone and 4-fluoro phenyl sulfone in varying amounts as set forth in Table 1, below. The batteries were prepared as generally described in Examples 1 to 10 of the present application.

5. The rates of increase in the thicknesses of the batteries prepared as described in Paragraph 4 were measured using the procedure described at page 14 of U.S. Application No. 09/766,520. The rates of increase are shown in Table 1, below.

Table 1

Sulfone based compound	Added amount (wt%)	Thickness variation of battery after charging (%)
-	0 (Comparative Example 1)	7.9
a) Vinyl sulfone	0.005	7.9
	0.05	7.8
	1 (Example 7)	4.5
	2 (Example 2)	3.4
	5 (Example 8)	3.4
	10	5.5
b) Phenyl sulfone	0.005	7.9
	0.05	7.8
	1 (Example 9)	6.1
	2 (Example 3)	5.3
	5	6.5
	10	8.5
c) 4-fluoro phenyl sulfone	0.005	7.9
	0.05	7.8

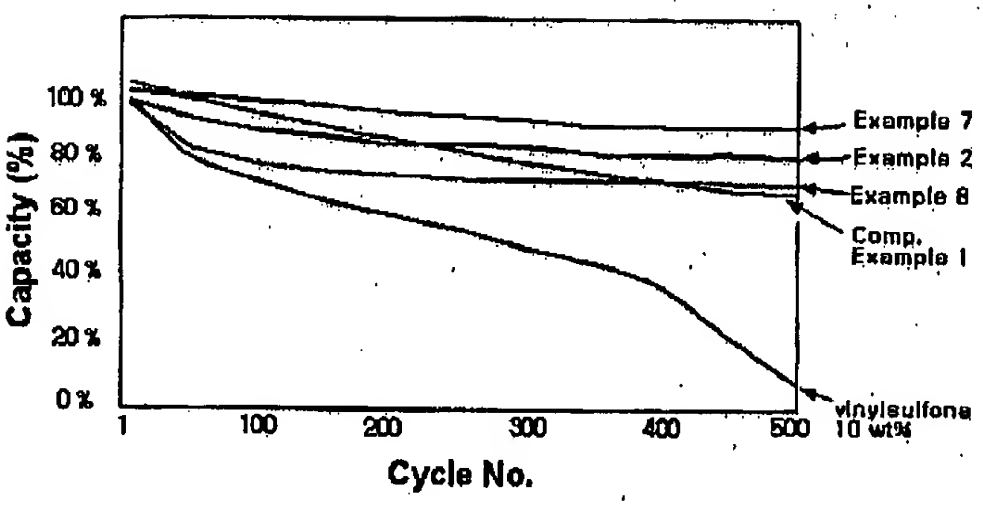
	1 (Example 10)	4.5
	2 (Example 4)	3.6
	5	5.8
	10	9.5

6. As shown in Table 1, the batteries having electrolytes containing a sulfone based compound in an amount ranging from 1 to 5 weight% showed a substantially smaller variation in thickness after charging compared to those batteries having electrolytes containing a sulfone based compound in an amount of 0.005 weight %, 0.05 weight% or 10 weight%. In my opinion, the smaller variation in thickness was unexpected.

7. U.S. Application No. 09/766,520 describes the measurement of the cycle life characteristics of batteries having electrolytes containing vinylsulfone in varying amounts at pages 16 to 17. The inventive batteries tested (Examples 7, 2 and 8) had electrolytes containing vinylsulfone in an amount of 1, 2 and 5 weight%, respectively. Using the same methodology described in U.S. Application No. 09/766,520, a battery having an electrolyte containing vinylsulfone in an amount of 10 weight% was prepared and tested. As shown in Figure 1, below, the batteries having electrolytes containing vinylsulfone in an amount of 1, 2 and 5 weight% retained their capacity significantly better than the battery having an electrolyte containing vinyl sulfone in an amount of 10 weight%. In my opinion, the substantially improved cycle life characteristics of batteries having electrolytes containing vinylsulfone in an amount of 1, 2 and 5 weight% compared to the battery having an electrolyte containing vinyl sulfone in an amount of 10 weight% were unexpected.

Figure 1

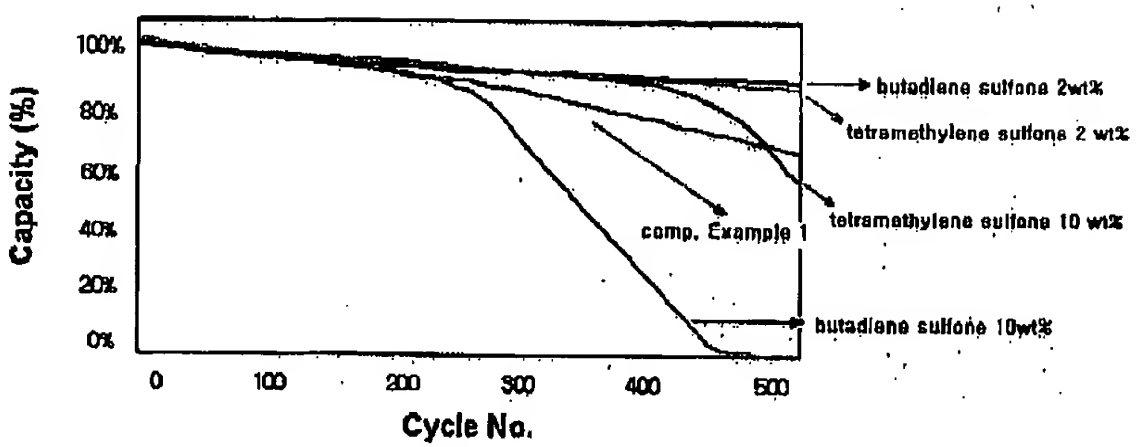
Application No. 09/672,287



8. Using the same methodology described in U.S. Application No. 09/766,520, batteries having an electrolyte containing either butadiene sulfone or tetramethylene sulfone in an amount of either 2 weight % or 10 weight% were prepared. The life cycle characteristics of those batteries were tested. As shown in Figure 2, below, the battery having an electrolyte containing butadiene sulfone in an amount of 2 weight% performed substantially better than the battery having an electrolyte containing butadiene sulfone in an amount of 10 weight%. Similarly, the battery having an electrolyte containing tetramethylene sulfone in an amount of 2 weight% performed substantially better than the battery having an electrolyte containing tetramethylene sulfone in an amount of 10 weight%. In my opinion, the substantially improved cycle life characteristics of batteries having electrolytes containing a sulfone based compound in an amount of 2 weight% compared to the batteries having electrolytes containing a sulfone based compound in an amount of 10 weight% were unexpected.

Figure 2

Application No. 09/672,287



9. In conclusion, in my opinion, as an expert in electrolytes for lithium batteries, the superior characteristics of batteries having electrolytes containing a sulfone based compound in an amount of 1, 2 or 5 weight% compared to batteries having electrolytes containing a sulfone based compound in an amount of 0.005, 0.05 or 10 weight% were unexpected.

10. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date December 24, 2002

By _____
Jin-Sung Kim